PUTTING RESEARCH TO WORK BRIEF

Automatic Vehicle Location Systems' Impacts on Transit in Smaller Cities

The need for a more efficient transit system has led transit agencies across the country to implement Automatic Vehicle Location systems. These computer-based vehicle tracking systems use Global Positioning Sytems or other technology to measure the location of each vehicle in a transit system and relay its location to a control center. By 2000, 88 transit agencies in the United States were equipped with operational AVL systems, and 142 were planning such systems, including many medium-sized and small transit agencies.

What's the Problem?

AVL systems are supposed to improve on-time performance and service efficiency, reduce rider wait time and improve safety and incident response time. However, it has been unclear whether the adoption of an AVL system actually impacts transit users, and whether these systems attract more riders. In addition, most prior research on AVL has studied large transit agencies. Since small and medium-sized transit agencies tend to have less severe congestion and fewer instances when vehicles are off-schedule, AVL's potential benefits in these systems are unclear.

Research Objectives

This project's goal was to evaluate transit user experiences and perceptions to determine if the implementation of an AVL system would increase ridership. Researchers set out to establish whether there was an actual improvement in on-time arrival, if the transit users perceived the improvement, and if these perceptions would lead to users riding more often.

Methodology

Researchers conducted before and after surveys of transit users' perceptions and of actual on-time bus performance in Racine and Waukesha, both Wisconsin cities with medium-sized transit systems. Quantitative data were collected to assess the impact of AVL on schedule adherence, passenger wait time, and passenger perception. Similar surveys were conducted in Manitowoc, Wis., which has a small transit system where AVL was not implemented. The project included these steps:

- Surveys were conducted in Racine and Manitowoc in 2001, and in Waukesha in 2002, before AVL systems were installed.
- AVL systems began operation in buses in Racine and Waukesha several months before follow-up surveys were conducted. Waukesha's system included electronic bus arrival information in its transit centers and some bus stops, while Racine's system did not include these features that are visible to riders.
- Follow-up surveys were conducted in 2005 in all three cities. The city of Manitowoc had originally intended to install an AVL system, but canceled the project, which allowed data collected there to be used as a control group to be compared with the data collected in Racine and Waukesha.

Results

The research gave some insight into the question, "Will AVL systems help to attract more transit riders?" About 36% of respondents indicated that they would ride more often if better and timelier transit information were available, but a larger group said they would ride the same amount.

Respondents consistently indicated that among all the factors likely to be influenced by AVL, "knowing when the bus will actually arrive at the bus stop" was most important to them. Since the AVL systems were still relatively new at the time of the study's end, only around 30% of riders knew that the

Investigators

"This research shows how knowing where buses are will improve the quality of the riding experience for transit users."

–Edward Beimborn (pictured), **Zhong-Ren Peng and Yi Zhu**
University of Wisconsin–Milwaukee

AVL systems can reduce passenger wait time, especially in transit systems that currently have poor on-time performance.

buses had the AVL system. Real-time information and timely transit dispatch were not available yet, pointing out a need to make real-time bus location information available at bus stops, on the Internet and by cell phone, and to publicize the availability of these services.

In Waukesha, transit manager Bob Johnson said he has been very satisfied with the AVL system, which has improved on-time performance and has been a good way to validate customer complaints, such as that the bus never came or was early or late. "Ridership is definitely up, but there is no way to say that it is due to the AVL system," Johnson said. "Gas prices are up, and that may have more to do with it." City of Racine Transit Planner Mike Glashen was also very satisfied with the system, which he said is mostly used as an internal tool for keeping buses on schedule.

AVL systems can clearly improve on-time performance and let riders know when buses will actually arrive. How much performance would be improved in a specific transit system depends on how poor the performance was to begin with. In a transit system with good on-time performance, the benefits of AVL would be less, and AVL might not be needed.

Implementation and Benefits

AVL should be considered for use by transit systems that currently have poor on-time performance; it holds the most promise in systems where on-time performance is a significant problem. The AVL systems should provide passengers with information about bus arrival times, as was done in Waukesha.

Eight to ten additional transit systems (out of 16 total) in Wisconsin have expressed interest in AVL. Transit system size may limit AVL implementation, in that the cost of an AVL system can equal or exceed a small system's total annual budget. Capital grants may be available if a strong case can be made for improvement of service through the implementation of AVL.

Further Research

Since the systems were relatively new and many survey respondents were unaware of the implementation of AVL and its benefits, future surveys and further monitoring of the systems would be useful to get a better picture of AVL's effects on ridership and systems performance.

Project Manager

"Each transit system has to be evaluated on its own merits. AVL is a tool for improving service, but it won't add much to a system that's already doing a good job."

–David Lowe
WisDOT Bureau of Transit, Local Roads, Railroads and Harbors
david.lowe@dot.state.wi.us

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James McDonnell, WisDOT Research and Communication Services